Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Facilitating Shared Use in the 3100-3550 MHz Band	)	WT Docket No. 19-348
	)	
	)	

COMMENTS OF COMMSCOPE, INC.

Jason E. Friedrich
Vice President, Government & Regulatory Affairs

Dave Wright
Head of Spectrum Policy & Standards

Mark Gibson
Director, Business Development & Spectrum Sharing Policy

COMMSCOPE, INC
19700 Janelia Farm Blvd
Ashburn, VA 20147
(703) 726-5900

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CommScope submits these comments in the above-captioned proceeding. [1]

I. INTRODUCTION AND SUMMARY

CommScope (listed on NASDAQ as COMM) helps companies around the world design, build and manage their wired and wireless networks. Since 1976, our network infrastructure solutions have helped customers increase bandwidth; maximize existing capacity; improve network performance and availability; increase energy efficiency; and simplify technology migration. CommScope solutions can be found in the largest buildings, venues and outdoor spaces; in data centers and buildings of all shapes, sizes and complexity; at wireless cell sites and in cable head-ends; and in airports, trains, and tunnels.

Through our Comsearch business unit, CommScope has long standing expertise in spectrum management, interference analysis and mitigation, and decades of experience in providing mission critical network infrastructure services. Comsearch maintains state-of-the-art software and comprehensive spectrum databases utilized in the design of complex wireless systems. We offer an

[1] *Facilitating Shared Use in the 3100-3550 MHz Band*, WT Docket No. 19-348, Report and Order and Further Notice of Proposed Modification, 35 FCC Rcd 11078 (2020) ("FNPRM").

extensive array of data and engineering solutions and consulting. We have been gathering data for over 40 years on microwave, broadcast, satellite, PCS, AWS and cellular networks from an abundance of sources. We verify, update and manage our extensive databases daily, and have amassed one of the largest and most accurate private collections of engineering data in the telecommunications industry. Our engineers rely upon these databases to perform thousands of interference analyses and frequency assignments per month. In addition to our in-house capabilities, below is a list of our publicly available offerings:

- FCC-certified Spectrum Access System (SAS) and Environmental Sensing Capability (ESC) provider for the Citizens Broadband Radio Service (CBRS)
- FCC-certified database administrator in the 70/80-90 GHz service
- Support the American Hospital Association for management of the Wireless Medical Telemetry Service (WMTS) registration database

CommScope interacts regularly with the Commission and the National Telecommunications and Information Administration (NTIA), and actively participates in various industry groups such as the Wireless Innovation Forum (WInnForum), the CBRS Alliance, the National Spectrum Management Association (NSMA), the 3rd Generation Partnership Project (3GPP), the Telecommunications Industry Association (TIA), and the Institute of Electrical and Electronics Engineers (IEEE) to develop standards, rules, and industry recommendations that promote the efficient use of the radio spectrum. A leading CommScope staff member also co-chairs subcommittees in the Commerce Spectrum Management Advisory Committee (CSMAC) and is Vice President and Vice Chair of the Wireless Innovation Forum. In addition, another staff member is President of the CBRS Alliance.

CommScope is pleased to provide the following comments to the Commission's Further

Notice of Proposed Rulemaking (FNPRM) and highlights the following points regarding commercial operations in the 3100-3550 MHz frequency range:

- CommScope supports commercial operations in the 3450-3550 MHz band and believes this spectrum is critical for mid-band 5G and 6G services;
- CommScope requests that the AMBIT study, or an unclassified version, be made public as soon as possible in order to fully understand the basis for the federal protection regimen recommended by the Commission and NTIA and in order to make more informed recommendations regarding appropriate coordination procedures;
- While supporting 3450-3550 MHz commercial operations, CommScope believes that more collaboration is needed between all of the industry stakeholders, the Commission, NTIA, and DoD in order to develop a sharing and coordination approach that maximizes the utilization of the band by both federal incumbents and new commercial operators;
- Given the limited information available, CommScope suggests a possible coordination approach in general terms based upon our experience with AWS sharing;
- CommScope supports NTIA's recommendations regarding future commercial services in 3100-3450 MHz and looks forward to engaging with our federal partners to that end; and
- CommScope strongly encourages the Commission to take a comprehensive view of the broader 3 GHz band (3100-3980 MHz) with the goal of making the most extensive and intensive use of all spectrum in this range, and we point out some of the current impediments to that goal.

II. COMMSCOPE SUPPORTS MAKING THE 3450-3550 MHZ BAND AVAILABLE FOR COMMERCIAL USE BUT MORE INFORMATION IS NEEDED TO ADDRESS FREQUENCY COORDINATION

A. CommScope Agrees that the 3450-3550 MHz Band Should be Repurposed and Made Available for Commercial Use

CommScope agrees with the Commission's finding that the 3450-3550 MHz band should be made available for non-federal fixed and mobile services (except aeronautical mobile) on a co-primary basis with the existing federal operations. Given the successes with federal/commercial sharing in both AWS bands and CBRS bands, and the Department of Defense's (DoD's) stated intent to relocate some of its operations, CommScope is confident that commercial services can operate in the band without creating harmful interference to federal operations, and at the same time be protected from harmful interference from the federal systems. Therefore, we believe a non-federal co-primary allocation of 3450-3550 MHz is consistent with fulfilling the Commission's obligations under Section 303(y).

Globally, the 3.4-4.2 GHz frequency range has emerged as the "sweet spot" for 5G mid-band services, providing a complementary mix of both coverage (range with MIMO antennas) and capacity (achieved with channel bandwidths of 80 or 100 MHz). The Commission has already allocated 430 MHz of spectrum from 3550-3980 MHz available with CBRS and C-Band. The power levels, tiered-access, and licensing characteristics of CBRS make it quite appealing for a broad range of use cases (e.g., mobile, fixed, private, and others), but these are not optimized for wide-area regional or national networks. The allocation of the 3450-3550 MHz band with similar service and licensing rules as C-Band would provide four contiguous blocks of 5G-optimized spectrum (three of 100 MHz, and one of 80 MHz). The fact that other countries have already allocated the 3.4-3.8 GHz range for 5G services ensures that a vibrant and robust hardware ecosystem (both infrastructure and client equipment) is already forming for the 3450-3550 MHz

range, and therefore the band can be quickly put to use.

B. The AMBIT Study Should Be Made Public in Order To Allow for Meaningful Comment on Coordination Regimes.

The FNPRM, and a related letter from NTIA's Office of Spectrum Management (OSM) to the Commission's chiefs of the Office of Engineering and Technology (OET) and Wireless Telecommunications Bureau (WTB), (the NTIA OSM Letter),[2] both make extensive reference to the White House and DoD America's Mid-Band Initiative Team (AMBIT), the study AMBIT conducted, and agreements that AMBIT reached. In particular, the recommendations in the NTIA OSM letter regarding the general protection requirements for incumbent federal operations, the concepts of Cooperative Planning Areas (CPAs) and Periodic Use Areas (PUAs), and the exclusion of Alaska and Hawaii from a commercial allocation are all based upon the AMBIT study, findings, and agreements. The FNPRM also asks for industry comment on the appropriate coordination regime to protect these incumbent federal operations from new commercial services "[i]n light of the AMBIT agreement recently reached between the DoD and the White House, . . ."[3] However, industry does not have access to the AMBIT study or its detailed findings. In order to meaningfully comment on the appropriate coordination regime for the 3450-3550 MHz band, industry must understand the foundational data, assumptions, and methodologies used in the AMBIT study. Without that information, it is practically impossible to effectively evaluate the approaches recommended in the OSM Letter and the FNPRM.

It has been CommScope's experience in both AWS-3 and CBRS that once industry is able to collaboratively and directly engage with DoD in evaluating these types of datum, studies, and

[2] Letter from Charles Cooper, NTIA OSM, to Ronald Repasi, Acting Chief of FCC OET, and Donald Stockdale, Chief of FCC WTB, September 8, 2020 (NTIA OSM letter).
[3] FNPRM at ¶47.

findings that coordination and protection requirements which redound to the maximum benefit of both DoD and new commercial users can be developed, tested, and implemented. Therefore, CommScope urges the Commission to request that an unclassified version of the AMBIT study and findings be made public as soon as possible.

C. The FNPRM Leaves Open a Number of Questions That Will Need To Be Addressed

Although CommScope wholeheartedly supports making more prime mid-band spectrum available for commercial operations, the FNPRM leaves open a number of questions that the Commission will ultimately need to address to facilitate shared use of the 3450-3550 MHz band.

The FNPRM notes that the NTIA OSM letter stating that "DoD has agreed to minimize operations in the 3450-3550 MHz band to the extent possible."[4] However, it is unclear whether this refers to only the CPAs and PUAs or to DoD operations throughout the entire contiguous United States (CONUS). It is also unclear whether this includes various Aerospace and Defense (A&D) contractor sites where testing is conducted in the band.[5] The extent to which DoD and A&D operations remain in place will have a substantial impact on coordination across the country. If there are only a few instances where coordination outside the CPAs and PUAs is necessary, this might entail quite a different approach than if there are substantial CONUS-wide operations that will require coordination.

In addition, details on the CPAs and PUAs are substantially lacking and substantially different from the Exclusion Zones identified in the NTIA's 3450-3550 sharing feasibility study,[6] or the

[4] FNPRM at ¶45 and NTIA OSM letter at p 2.
[5] We note that for CBRS, there is at least one A&D contractor site that must be protected at McKinney, TX (https://www.ntia.doc.gov/files/ntia/publications/p-dpas.kml).
[6] Results starting at §5.3.2 in the NTIA report.

NTIA's Fast Track Report.[7] The NTIA OSM letter also identifies three sites as CPAs and PUAs (Edwards AFB, CA; Chesapeake Beach, MD and Portsmouth, NH) that were not identified in any of the previous studies (See Appendix A). We are aware that there are considerably fewer CPAs and PUAs than the over 160 sites identified in both NTIA reports, but it would be helpful to understand how locations could be added that were previously not presented.

Moreover, the NTIA OSM letter simply describes the CPA and PUA concepts broadly, but provides no details on the boundaries, whether the boundaries might extend outside the associated military bases, the extent to which interference from high-powered federal systems will affect commercial operations proximate to CPAs, or how coordination in these areas will be effectuated. Given that the AMBIT study on which CPAs and PUAs is based has not been made public, it is difficult to assess the feasibility of this approach since substantial details are missing.

The NTIA OSM letter also states that the DoD will work with industry to coordinate operations within the CPAs and PUAs, but neither the NTIA letter nor the FNPRM describe this process other than to say that prior to an auction, "DoD will establish coordination offices for the DoD and industry coordination, which will be published through NTIA."[8] In addition, the FNPRM notes that "DoD anticipates holding workshops with wireless carriers to begin discussing such issues, similar to information sharing and transition planning that occurred with industry as part of the AWS-3 auction."[9] However, in contrast to this proceeding, the collaboration in AWS-3 that the Commission refers to notably occurred *before* the AWS-3 rulemaking was issued, and in fact,

[7] U.S. Department of Commerce, National Telecommunications and Information Administration, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz,4380-4400 MHz Bands* (Nov. 15, 2010), (Fast Track Report).
[8] *Id* at p 7.
[9] FNPRM at ¶46.

helped to inform the rulemaking and subsequent engagement.[10] In addition, the Public Notice resulting from this engagement formed the basis of the coordination procedures in the 1695-1710 MHz and 1755-1780 MHz bands.[11] In this current rulemaking, collaboration will occur *after* the FNPRM has been released. Consequently, many of the questions the Commission poses in the FNPRM may ultimately be addressed in this "*ex post*" collaboration. We urge the Commission, NTIA and DoD to engage with *all* commercial interests as soon as possible.

III. THE COMMISSION SHOULD COLLABORATE WITH ALL INDUSTRY STAKETHOLDERS ON FREQUENCY COORDINATION IN THE 3450-3550 MHZ BAND AND SHOULD NOT EXTEND THE SENSING APPROACH IN CBRS TO THIS BAND

A. The Commission Can Draw Upon the Frequency Coordination Process Used for the AWS-3 Band.

The Commission proposes to make federal and commercial use co-primary in the 3450-3550 GHz band and suggests that coordination will be required for CONUS commercial operations and for operations proximate to CPAs and PUAs.[12] We strongly urge the Commission to consider working with NTIA and the DoD as soon as possible to conduct workshops to establish a frequency coordination process. One example of a possible approach is the coordination symposia that CommScope (under the Comsearch business unit) conducted with CTIA and CCA for AWS-3.[13]

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[10] For AWS-3, the Commission relied on the Commerce Spectrum Management Advisory Committee (CSMAC) which met for nearly a year to study ways to facilitate the implementation of commercial wireless broadband in the 1695-1710 MHz and 1755-1850 MHz band. CSMAC recommendations helped NTIA to work with the FCC to formulate service rules for the band, including terms of sharing and required protections.

[11] FNPRM at FN 97: "*The Federal Communications Commission And The National Telecommunications And Information Administration: Coordination Procedures In The 1695-1710 MHz and 1755-1780 MHz Bands*," Public Notice, 29 FCC Rcd 8527 (WTB/NTIA 2014) ("PN DA 14-1023").

[12] FNPRM at ¶ 38, "…incumbent federal operations in the band would need to coordinate with and not cause harmful interference to any new, flexible use operations in the band…"

[13] See, for example, U.S. Department of Commerce, Sixth Interim Progress Report on the Ten-Year Plan and Timetable, June 2016 at FN 26, " CTIA—The Wireless Association®, the Competitive Carriers Association ("CCA"), and Comsearch hosted an informal "AWS-3 Frequency Coordination Symposium" on June 4, 2015, bringing potential AWS-3 licensees and federal agency representatives together to discuss data acquisition, analysis procedures notification processes, and time frames for complying with provisions of the AWS-3 Coordination Procedures PN."

We brought in all AWS-3 stakeholders for a day-long discussion of processes and procedures for complying with coordination rules. The goal was to understand and agree on data acquisition, analysis procedures, notification processes, and time frames. Participants included members of the Commission, NTIA, DoD and all other agencies with interests in the AWS band. We would certainly like to note from our experience that all stakeholders should be willing and able to participate.

More generally, frequency coordination has been used to great success in coordinating commercial operations in the AWS bands.[14] We note that CommScope (under Comsearch) helped to develop these frequency coordination portals while supporting the JSC. The portals are used to exchange data on frequency assignment requests, which are analyzed by software tools developed exclusively to perform these analyses (we also note that our tool, iQ.clear, was used initially by the DSO to perform these analyses). These portals are likely the basis of NTIA's proposed "incumbent-informing system" or "IIC"[15] as mentioned in its report on the 3100-3550 MHz band[16] and in the FNPRM.[17]

Given our long and extensive frequency coordination experience, as well as our experience with coordination in AWS, both helping to develop the portal concept and using it as a frequency coordinator, CommScope strongly urges the Commission to collaborate with stakeholders using similar processes and procedures used in the AWS-3 proceeding, as detailed in Public Notice DA

[14] See "1755-1780 MHz Early Entry Portal", https://1755eep.com/_layouts/15/EEPSolution/Login.aspx?ReturnUrl=%2f_layouts%2f15%2fAuthenticate.aspx%3fSource%3d%252F&Source=%2F and "1695-1710 MHz Radio Frequency Coordination Portal", https://rfcp.ntia.doc.gov/

[15] NTIA is now referring to this is their incumbent informing capability (IIC).

[16] Wilbur L. Ross and Douglas W. Kinkoph, *Feasibility of Commercial Wireless Services Sharing with Federal Operations in the 3100-3550 MHz Band,* at p 11 (July 2020), https://www.ntia.doc.gov/files/ntia/publications/ntia_3100-3550_mhz_mobile_now_report_to_congress.pdf

[17] FNPRM at ¶53.

14-1023.

We note one major difference in the 3450-3550 MHz band as compared with the AWS-3 band is that coordination in the 3450-3550 MHz band will be bi-directional: commercial licensees will coordinate with DoD use outside the CPAs/PUAs and DoD use will be coordinated with commercial licensees similarly. Based on our experience working with federal spectrum users, especially the DoD, we are not sure of the extent to which data on both existing and proposed DoD systems can be made publicly available. Consequently, coordination in the band may require a frequency coordinator with the appropriate credentials to receive and safeguard CUI (controlled unclassified information) and classified data.

Figure 1 below shows the basic coordination process CommScope developed for AWS-3 based on Public Notice DA 14-1023 for coordination of commercial users with DoD systems. Figure 2 shows how the process might work reciprocally for coordination of DoD systems with commercial users. In both cases we identify a "Coordinator," as mentioned above. Stakeholders will need to decide whether there should be a single coordinator who handles coordination requests for both commercial users and DoD, or if the responsibilities should be separated such that there is a single coordinator for commercial coordination with the DoD yet multiple commercial coordinators for commercial licensees. In the former case, while the process will be simplified by having a single coordinator, commercial licensees might be concerned that a DoD coordinator might not act in their best interests. In the latter case, multiple coordinators might address possible conflicts of interest, but could add additional complications especially if there are multiple commercial coordinators. In either case, this should be discussed and decided among all stakeholders.

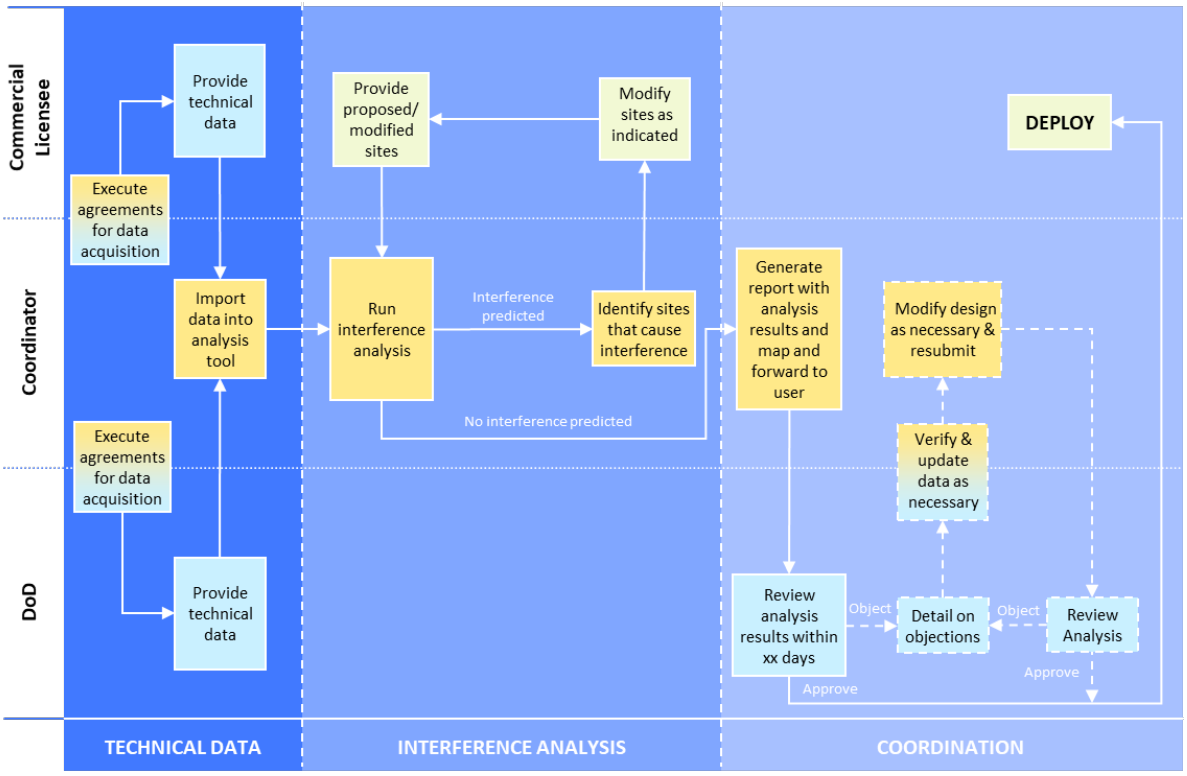

Figure 1: Coordination Process Flow for Commercial Users Coordinating with DoD

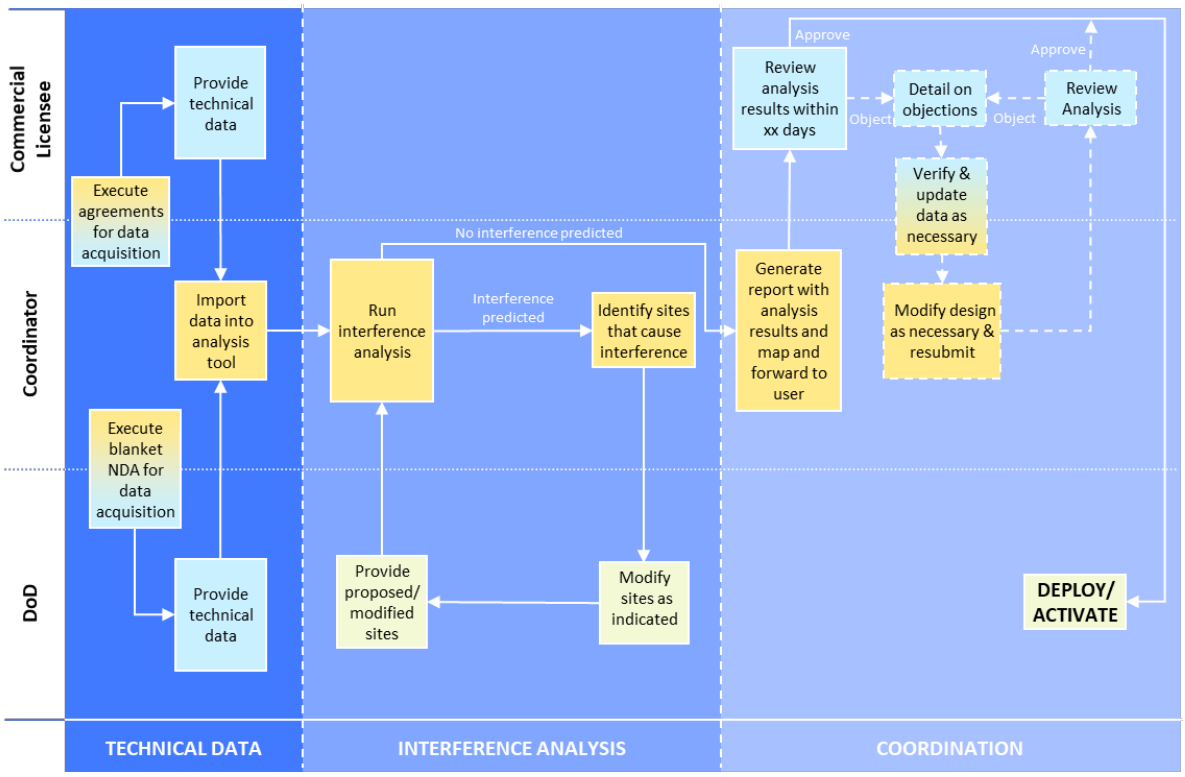

Figure 2: Coordination Process Flow for DoD Coordinating with Commercial Users

B. CommScope Urges the Quick Development and Roll Out of the Informing Incumbent Capability (IIC)

As noted above, both the Commission and NTIA have mentioned the IIC in the context of informing commercial licensees of the DoD's need to operate in CPAs and PUAs as well as during times of national emergency.[18] CommScope strongly supports the quick development and roll out of an IIC to inform commercial licensees of the DoD's need to "take back" spectrum. Accordingly, we strongly urge the Commission not to consider the use of a sensing approach such as the ESC that has been deployed for CBRS.

CBRS necessitated sharing directly with DoD radar systems in the 3550-3650 MHz band, directly above the 3450-3550 MHz band. This has been accomplished by deploying an extensive network of sophisticated and sensitive coastal radar detectors called an ESC. ESC sensors are configured to sense shipborne aircraft marshalling radars, then communicate to the SAS that radar operation has been detected. The SAS then configures the devices under its management to not cause interference into the detected radar systems. Since the actual location of the radar operation is often classified, operational location is obfuscated to a large area called a Dynamic Protection Area (DPA).[19] Associated with each DPA is an inland neighborhood where CBRS devices must be managed to limit aggregate interference into radars.

While the ESC approach is a workable way to detect radars and avoid interference, it is not optimal. One of the inherent drawbacks of this approach is that ESC sensors themselves must be protected from interference due to CBRS devices. This protection requirement gives rise to zones around each sensor known as "whisper zones" where CBRS devices must be further managed to not

[18] We note the Commission asks what should constitute a "National Emergency" in the context of notifying commercial licensees operating in the 3450-3550 MHz band. We would ask why 47 U.S.C. § 606(c) would not apply here as it does for CBRS. (FNPRM at ¶ 53 and CBRS R&O and Second FNPRM at ¶268)?

[19] *Promoting Investment in the 3550-3700 MHz Band*, GN Docket No. 17-258, Order, 33 FCC Rcd 4987 (2018).

interfere with ESC sensors. The management of CBSDs within whisper zones, including potential CBSD siting restrictions to avoid interfering with ESCs further limits commercial operations in the band. Indeed, the Commission asks in the FNPRM whether proposed EIRP for the 3450-3550 MHz band would impact ESC sensors in the CBRS band and, if so, what effect this could have for access to the lower 100 megahertz of the CBRS band.[20]

Consequently, we urge the DoD and NTIA to commit to development and quick roll out of an IIC and consider using an IIC in the future in lieu of requiring the deployment of a sensor network. As noted above, the IIC is similar to the AWS portals already in use except that these portals are used to let commercial spectrum users inform federal users of their proposed operation.[21] We also suggest that the DoD and NTIA work with commercial stakeholders to design, develop, test and introduce the IIC as quickly as possible. In addition, the IIC should become a program of record at the NTIA and should be funded accordingly. CommScope is willing to help with SME support, requirements, test cases, testing, etc.

We also note that informing commercial licensees of DoD operations through the IIC is only part of the process of interference protection. There needs to be a mechanism for commercial systems operating in the 3450-3550 MHz band to reconfigure in the event of an IIC notification. Certainly, one approach to affect these notifications dynamically would to be through a SAS-like approach. However, we suggest that reconfiguration of commercial systems under these circumstances should be discussed by all stakeholders in the context of the collaboration with the

[20] FNPRM at ¶ 73.

[21] We also note that informing the public about domestic military operations is not without precedent. The DoD informs civilian aviation users regarding DoD operations that could affect aviation safety by using Military Operations Areas (MOAs). These are areas where military activity (typically airborne) could pose a threat to aviation safety. MOAs are charted and their activity is announced to the public through Notices to Airmen (NOTAMs). NOTAMs typically tell which MOAs are active and for what periods of time. For more information on MOAs, see: https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap3_section_4.html.

Commission and other agencies mentioned above.

IV. COMMSCOPE SUPPORTS ALLOWING COMMERCIAL OPERATIONS BELOW 3.45 GHz

In response to the Commission's question on the feasibility of commercial operations below 3.45 GHz (i.e. between 3100-3450 MHz), with the limited information that is available at this time regarding the federal incumbent operations in those frequencies, CommScope supports NTIA's recommended path forward, as outlined in their July 2020 report to Congress on the "Feasibility of Commercial Wireless Services Sharing with Federal Operations in the 3100-3550 MHz Band."[22] In its report, NTIA described in general terms the airborne, ground-based, and shipborne radar systems operating in the overall 3100-3500 MHz bands, while acknowledging that NTIA's more detailed sharing analysis to date has focused on the 3450-3550 MHz band. With respect to the 3100-3450 MHz bands, we agree with NTIA's recommendations for "(i) a more in-depth assessment of the extent each of the federal systems is used; (ii) the development of a reliable mechanism for commercial operations to coordinate when federal systems are operating; (iii) assessment of the potential for relocating federal systems, such as nationwide airborne systems; and (iv) consideration of improved out-of-band emission limits for future commercial operations in the band."[23]

While NTIA and DoD will naturally be required to perform the analysis detailed in NTIA's recommendations (i) and (iii), CommScope strongly believes that early industry and Commission engagement on recommendations (ii) and (iv) will both expedite the overall time required for commercial operation in these bands and lead to a sharing/coordination regime that is structured to

[22] Edward Drocella, Robert Sole, Nickolas LaSorte, *Technical Feasibility of Sharing Federal Spectrum with Future Commercial Operations in the 3450-3550 MHz Band*, NTIA Technical Report 20-546 (Jan. 2020) ("NTIA Report")
[23] *Id*. at p "x".

the maximum benefit of both federal and commercial users. This has been our experience with the AWS and CBRS bands, and the Commission should leverage existing engineering and leadership relationships as it approaches commercial use throughout the entire 3100-3550 MHz range. CommScope also notes that improving the out-of-band emission performance of commercial radios may involve engineering development efforts around the radio 'front end' and almost certainly would require design modifications of existing off-the-shelf equipment. For these reasons, it is extremely important that industry is made aware of any such requirements as early as possible so that this work can be initiated and not dramatically delay the point where this new band could be put into commercial service.

V. THE COMMISSION SHOULD TAKE A COMPREHENSIVE APPROACH TO THE 3 GHZ BAND

CommScope applauds the Commission for seeking input on "the technical approach that will maximize the spectral efficiency of *3 GHz spectrum*,"[24] as this request acknowledges the role the entire 3 GHz band will play as critical mid-band spectrum essential to our country's wireless leadership for the next decade and beyond. While this overall 3 GHz band (i.e. 3100-3980 MHz) has been, and will continue to be, put into commercial service in phases, from CBRS to C-Band to this proceeding on 3450-3550 MHz to future action on 3100-3450 MHz, it is almost a certainty that commercial operations in the entire 3 GHz band will be based upon time division duplex (TDD) variants of 3GPP standard technologies (e.g. 4G LTE, 5G New Radio [NR], and potentially 6G). There may be a small proportion of legacy non-3GPP technologies operating in 3650-3700 MHz in the short term, but over time CommScope expects that these uses will also convert to 3GPP technologies due to the economic and efficiency benefits. Given this eventuality, it is imperative

[24] FNPRM at ¶72 (emphasis added).

that the Commission implement technical rules that yield the most extensive and intensive use of the spectrum from 3100-3980 MHz.

The current outlook for commercial operations in the overall 3 GHz band is comprised of 4 sub-bands that are alternately characterized as either high or low power, large area or localized coverage, dynamic or manual coordination, and few or many use cases and deployers. While it is hard to accurately predict what future commercial operations in 3100-3450 MHz might look like, given the number and nature of federal operations in those frequencies a likely outcome would be for lower power, dynamically coordinated commercial access. Combined with the Commission's proposed technical rules for 3450-3550 MHz, this would result in a "patchwork" approach for 3 GHz, as illustrated in the following representation.

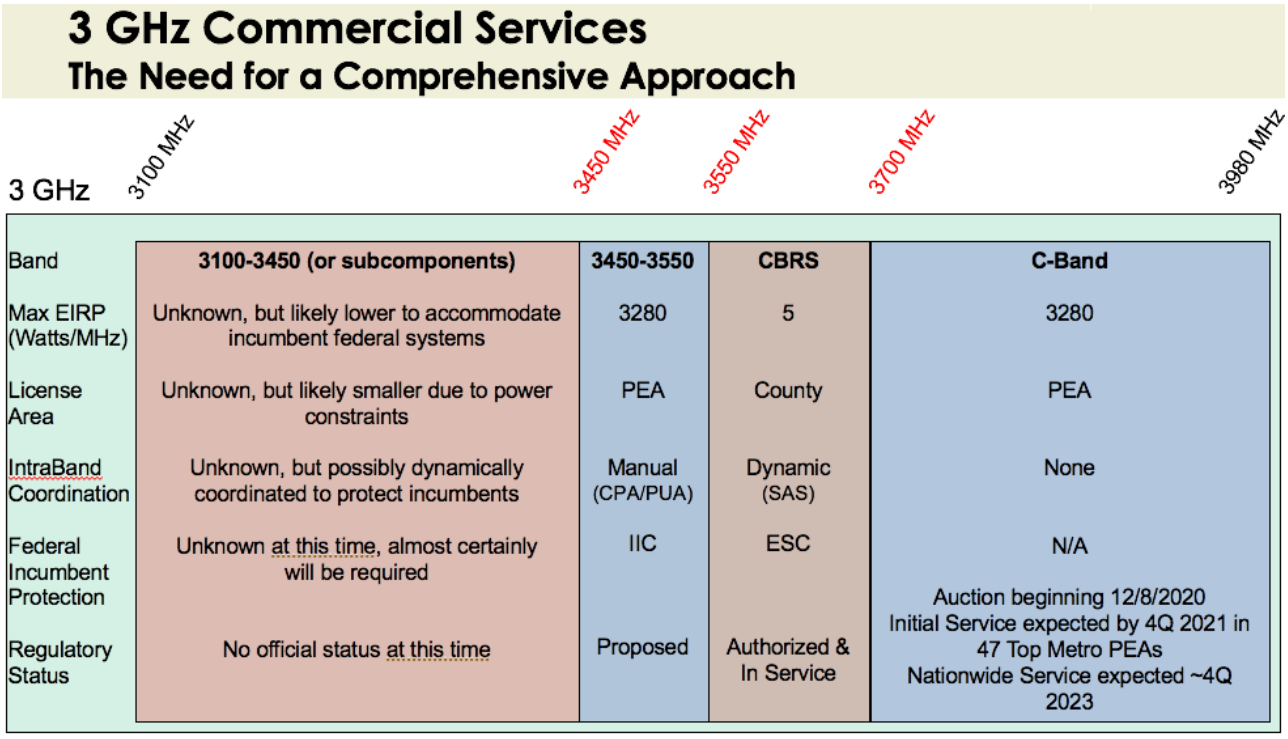

Figure 3: The "Patchwork" Outcome in the 3 GHz Band

This outcome would be particularly challenging as it would result in significant power

imbalances between uncoordinated TDD operations at the 3450 MHz, 3550 MHz, and 3700 MHz "band edges."

Industry is already anticipating the impacts at 3700 MHz as high-power C-Band services (*up to 3280 Watts/MHz EIRP*) are deployed above 3700 MHz in the next 12-18 months and operate adjacent to the lower power CBRS services (*limited to 5 Watts/MHz EIRP*) which have been authorized and are rapidly being deployed since January 2020 below 3700 MHz. In response to the Commission's encouragement for a multi-stakeholder industry group to look at the 3700 MHz issues, the C-Band Technical Working Group on 5G/Citizens Broadband Radio Service Coexistence recently produced a report analyzing the impacts around 3700 MHz and concluded that uncoordinated operations could "mutually degrade the performance" of both CBRS and C-Band services depending upon the deployment particulars (e.g., proximity, power levels, antenna characteristics, etc.).[25] The CBRS Alliance cited hypothetical scenarios in a recent FAQ to its members with mild inter-band interference resulting in a 5% loss of throughput, while a severe interference scenario could result in up to 90% throughput loss.[26]

Given that the Commission is proposing almost identical commercial service rules in the 3450-3550 MHz band (*up to 3280 Watts/MHz EIRP*) as exist in the C-Band, uncoordinated TDD operations across the 3550 MHz band edge would almost certainly have similar performance issues, and in this case the impacts would be to the lower frequency range of CBRS – the spectrum where almost $4.6 billion of Priority Access Licenses (PALs) were recently auctioned by the Commission. Of potentially even greater significance, the high-power operations below 3550 MHz could very possibly impair the ability of the CBRS Environmental Sensing Capability (ESC) sensors in their

[25] C-Band Technical Working Group 4 (TWG-4) Report on 5G/CBRS Coexistence; WT--Docket 18-122 (filed Oct. 12, 2020).
[26] C-Band and CBRS Frequently Asked Questions, CBRS Alliance, October 29, 2020 https://www.cbrsalliance.org/wp-content/uploads/2020/10/CBRS_C-Band_FAQ_Final.pdf

critical role of detecting DoD incumbent systems and protecting them from harmful interference from commercial CBRS operations in the 3550-3650 MHz range. As explained above, we urge the Commission, working with NTIA, DoD, and industry, to quickly develop and deploy an IIC for federal systems protection, and we would further encourage the Commission to consider utilizing IIC for protection of federal incumbents in CBRS (3550-3650 MHz) in order to have a consistent approach. As considerations for commercial services in 3100-3450 MHz move forward, the default approach for sharing with any federal systems that may remain in the band(s) should be based on an IIC to again ensure this consistency across all the portions of 3 GHz where commercial/federal sharing is implemented.

CommScope notes that industry trade organizations the CBRS Alliance[27], NCTA[28], and WISPA[29], representing many hundreds of companies from a variety of sectors, have all filed letters expressing concerns about the impact of future 3450-3550 MHz operations on the upper adjacent CBRS band. CommScope generally agrees with the analysis and concerns expressed in these letters. We specifically support the recommendation from the CBRS Alliance that "[t]he Commission should address industry coordination around these types of issues at the 3550 MHz band edge in any proceeding."

In order to maximize the spectral efficiency and value of both 3450-3550 MHz and CBRS operations, CommScope strongly supports a coordination process for TDD configurations between adjacent users at the 3550 MHz band edge. The SAS and related Coexistence Manager (CxM) components could be leveraged to facilitate this coordination for the CBRS operations, and potentially could be expanded to accept inputs on TDD parameters from the 3450-3550 MHz

[27] CBRS Alliance letter, WT 19-348, September 31, 2020.
[28] NCTA letter, WT 19-348, October 26, 2020.
[29] WISPA letter, WT 19-348, September 17, 2020.

licensees as well. While the FNPRM notes that the Commission did not require synchronization or coordination at 3700 MHz in its *3.7 GHz Service Order*, the reality is that this omission has resulted in a "best effort" approach from industry which is somewhat reliant upon all participants voluntarily acting for the "greater good,'" perhaps at the expense of the optimal configuration supporting their own particular service requirements. Given the significant impacts from uncoordinated operations, the Commission should take a more direct role to facilitate coordination at the 3550 MHz band edge.

CommScope also recommends that the Commission maintain such a proactive stance on coordination if and when some or all of the 3100-3450 MHz range is made available for commercial services.

VI. CONCLUSION

As a key component of the broader 3 GHz band, the 3100-3550 MHz range (and 3450-3550 MHz specifically), are key mid-band frequencies that will be critical to maintaining and extending the United States' leadership in wireless technologies and services for the next decade and beyond. It is therefore imperative that the sharing, coordination, and service rules for these frequencies are optimized for both the existing federal operations and the new commercial operations. It is also necessary to view each of these sub-bands in the overall context of 3 GHz and ensure that inter-band impacts do not degrade the utility of this strategic mid-band spectrum.

Respectfully submitted,

/s/ Dave Wright

Dave Wright
Mark Gibson
Jason E. Friedrich

CommScope, Inc.
19700 Janelia Farm Blvd.
Ashburn, VA 20147
(703)-726-5900

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VII. APPENDIX A

List of CPAs and PUAs showing all radar systems identified in each location as mentioned in the NTIA Technical Study and Fast Track Report. Highlighted below are the three locations not mentioned in either the NTIA Technical Study or the Fast Track Report: Edwards AFB, CA; Chesapeake Beach, CA and Portsmouth, NH.

Base	State	AS1	AS2	AS3	GB1	GB3	GB4	GB5	GB6	DS1	SB	CPA	PUA
Little Rock AFB	AR	x	x									x	
Yuma Proving Ground	AZ				x	x						x	x
Edwards AFB	**CA**											x	x
Fort Irwin (National Training Center)	CA				x							x	x
Marine Corps Air Ground Combat Center Twentynine Palms	CA				x	x						x	
Marine Corps Base Camp Pendleton	CA					x						x	
Naval Air Warfare Center (Air Weapons Sta) China Lake	CA				x	x						x	x
Naval Base Ventura County (Naval Air Station Point Mugu)	CA			x	x	x				x		x	x
San Diego (Includes Point Loma SESEF* range)	CA										x	x	
Eglin AFB (Includes Cape Sand Blas site)	FL					x						x	x
Mayport (Includes Mayport SESEF* range)	FL										x	x	
Pensacola	FL										x	x	x
Fort Polk (Joint Readiness Training Center)	LA				x							x	x
Chesapeake Beach (Naval Research Lab)	**MD**											x	x
Naval Air Station Patuxent River	MD			x		x			x	x		x	x
Webster Field (St. Inigoes)	MD										x	x	x
Bath (Supervisor of Shipbuilding, Conversion & Repair)	ME										x	x	x
Pascagoula (NS Pascagoula)	MS										x	x	x
Fort Bragg	NC				x							x	x
Marine Corps Air Station Cherry Point	NC					x						x	
Marine Corps Base Camp Lejeune	NC					x						x	
Portsmouth (Portsmouth Navy Shipyard)	**NH**											x	x
Moorestown Combat System Engineering Development Site (CSEDS)	NJ				x		x				x	x	x
White Sands Missile Range	NM				x	x						x	x
Tonopah Test Range (NTTR)	NV				x							x	x
Fort Sill	OK				x	x						x	x
Tobyhanna Army Dep	PA				x	x						x	
Dahlgren (Naval Surface Warfare Center)	VA										x	x	x
Newport News	VA										x	x	x
Norfolk (Includes Fort Story SESEF* range)	VA										x	x	
Wallops Islands (Surface Combat Systems Center)	VA										x	x	x
Bremerton	WA										x	x	x
Everett (Includes Ediz Hook SESEF* range)	WA										x	x	

*SESEF: Shipboard Electronic Systems Evaluation Facility

Appendix A (cont'd)

Identification and description of radar operations at bases indicated above.

Designation	Description
AS1 & AS2	U.S. Air Force SKE (here in after referred to as Airborne System 1 and Airborne System 2, or as the "nationwide airborne systems") is used to enhance flight safety as well as facilitate the management of cargo multi-ship formations. SKE formations can range in size from a two-aircraft element to multi-element formations. The operator selects the desired formation position prior to takeoff and the SKE system uses pulsed RF signals to maintain that position. The interference protection criteria for the SKE is based on an S/I level. Airborne System 1 and Airborne System 2 are authorized to operate throughout the United States and Possessions. Airborne System 1 and Airborne System 2 have two types of antennas, omni-directional and directional. AS1 & AS2 are the Zone Marker locations that operate in conjunction with the airborne equipment. The Zone Marker is a ground-based transceiver used to provide a ground reference point to enhance aircraft navigation.
AS3	The Naval Air Systems Command (NAVAIR) Range Systems operate what is referred to as Airborne System 3.
GB1	The Army operates Ground-Based Radar One (GB1) systems at the locations shown in Table 4. GB1 radar is specifically designed to locate the firing positions of both rocket and mortar launchers. The system has been tested and has been accepted by the DOD. GB1 radar systems will replace the aging medium-range radars now in the DOD's inventory. GB1 radar includes a number of improvements, including 360 degree coverage capability instead of the current radar's 90 degree capability. The Army operates GB1 radar at many locations within the U.S. However, the sites requiring protection exclusion zones provided in Table 3-4 (Fast Track Report) was limited to the locations where the radar requires use of its full tuning range. The radar does not require use of the upper portion of its tuning range at the many other locations.
GB3	The Navy/United States Marine Corps operates Ground-Based Radar Three (GB3) systems at the locations shown in Table 5. GB3 is a multi-function system that provides surveillance, air traffic control and fire quality data. These radar systems will also replace aging systems now in DOD's inventory.
GB4	DOD also operates Ground-Based Radar Four (GB4) systems at locations listed in Table 6
GB5	DOD also operates Ground-Based Radar Five (GB5) systems at one location listed in Table 7
GB6	The NAVAIR Range Systems operate a GB6 system at Patuxent River, MD.
DS1	The NAVAIR Range Systems operate a Ground-Shipborne Based System (Dual 1) at the location in Table 9.
SB	The Navy uses this band for a number of shipborne radionavigation purposes, including air operations, ATC, and approach control. Navy operates marshalling ATC radar systems on all aircraft carriers and amphibious assault ships for vectoring aircraft into final approach. This ATC system also serves as a backup short-range, air-search radar system. Shipborne radars operate around the world and anywhere along the U.S. coasts. A minimum distance of 10 km from the coast is used in the analysis for shipborne radar systems. Shipborne radars can also radiate at all major Navy ports, shipyards, and some commercial ports. Operations are authorized at the locations shown in Table 10. The operation of shipborne radars at a distance of at least 10 km from the coast is based primarily on practice; not regulation. Practice is based on Navy efforts to reduce potential electromagnetic interference impacts near shore and ports. Recognized limits of operation are generally prescribed through numbered fleet restrictions, but a limited number of distance restrictions have been captured in the Government Master File (GMF) frequency authorizations.
CPA	Cooperative Planning Areas are geographic locations in which non-federal operations shall coordinate with federal systems in the band to deploy nonfederal operations in a manner that shall not cause harmful interference to federal systems operating in the band. In such areas, operators of non-federal stations may be required to modify their operations (e.g., reduce power, adjust antenna pointing angles, etc.) to limit emissions at certain locations and may not claim interference protection from federal systems. To the extent possible, federal use in Cooperative Planning Areas will be chosen to minimize operational impact on non-federal users. Cooperative Planning Areas may also be Periodic Use Areas. Coordination between federal users and non-federal licensees in Cooperative Planning Areas shall be consistent with procedures established by the FCC in coordination with NTIA.
PUA	Periodic Use Areas are geographic locations where non-federal operations in the band may not cause harmful interference to federal systems operating in the band for episodic periods. During these times and in these areas, federal users may require interference protection from non-federal operations. Non-federal operations may be required to temporarily modify their operations (e.g., reduce power, adjust antenna pointing angles, etc.) to limit emissions, which may include restrictions on non-federal stations' ability to radiate at certain locations. During such episodic time periods, non-federal users in Periodic Use Areas must alter their operations to enable federal systems' use of the band, and during such times, non-federal users may not claim interference protection from federal systems. To the extent possible, federal use in Periodic Use Areas will be chosen to minimize operational impact to non-federal users. Coordination between federal users and non-federal licensees in Periodic Use Areas shall be consistent with procedures established by the FCC in coordination with NTIA. While all Periodic Use Areas are co-located with Cooperative Planning Areas, the exact geographic area used during periodic use may differ from the co-located Cooperative Planning Area. Restrictions and authorizations for the Cooperative Planning Areas remain in effect during periodic use unless specifically relieved in the coordination process.